

IN THE UNITED STATES PATENT OFFICE

--A SINGLING DEVICE AND A SINGLING METHOD--

5

BACKGROUND OF THE INVENTION.

[0001]The invention relates to a singling device for singling sheet metal panels comprising two tendering positions arranged one after the other in the longitudinal direction to offer a respective sheet metal panel stack, said two tendering positions being provided with a lifting means able to be reciprocated in the longitudinal direction for lifting individual sheet metal panels and for feeding the sheet metal panels in the longitudinal direction to a working site. The invention also relates to a method for singling.

THE PRIOR ART.

[0002]In the case of a singling device forming part of the prior art the lifting means feeds the sheet metal panels firstly from the first stack and then from the second stack to the same position, which is for example provided in the vicinity of a working site for the further processing of the sheet metal panels. In this respect for instance the first tendering position is further removed from this position than the second tendering position. When the sheet metal panel stack at one tendering position has been dealt with, that is to say a fresh sheet metal panel stack must be offered, the lifting means deals with the sheet metal panel stack held on the other tendering position and feeds the sheet metal panels to the same position. The lifting means then reciprocates on the

guide means and more particularly travels a comparatively long distance to the first tendering position. This requires a comparatively long time.

#### SHORT SUMMARY OF THE INVENTION

5 [0003]One object of the invention therefore is to provide a singling device and a method of the type initially mentioned which are so further developed that the working cycles are accelerated.

10 [0004]In the case of such a singling device of the type initially mentioned the object of the invention is to be attained by arranging a longitudinal conveying means between the two tendering positions, which is able to be moved in the longitudinal direction, and which terminates in a first longitudinal position moved toward the working  
15 site on the one hand in the vicinity of the first tendering position remote from the working site and on the one hand bridges over the second tendering position so that the lifting means feeds the sheet metal panels lifted from the first sheet metal panel stack onto the  
20 longitudinal conveying means and which in a second longitudinal position moved away from the working site frees the second tendering position.

[0005]When the first stack of sheet metal panels has been processed, the lifting means moves a short distance  
25 between the first stack and a deposit position on the longitudinal conveying means. The longitudinal conveying means, which then assumes the first longitudinal position, feeds the sheet metal panels toward the working site past the second tendering position. The distances traveled by  
30 the lifting means are accordingly substantially reduced. The singling device accordingly functions efficiently and

rapidly.

[0006]When however the longitudinal conveying means is located in the second longitudinal position, the second tendering position is accessible for the lifting means.

5 It then lifts sheet metal panels from the second stack and moves same in the longitudinal direction forward to the said position. This corresponds to the movements so far.

[0007]Further advantageous developments of the invention are defined in the claims and described in the  
10 specification.

[0008]It is convenient to provide a second longitudinal conveying means between the second tendering position and the working site, the panels being transferred in the first longitudinal position of the first longitudinal conveying means by the first longitudinal conveying means  
15 and in the second longitudinal position of the first longitudinal conveying means by the lifting means to the second longitudinal conveying means.

[0009]Preferably a rejects deposit position is provided in the longitudinal direction adjacent to the first tendering  
20 position on the side opposite to the working site, at which reject deposit position defective sheet metal panels and/or sets of sheet metal panels with two or more unsingled sheet metal panels are deposited.

25 [0010]When the lifting means is dealing with the first stack, the defective sheet metal panels or sets thereof may be deposited at the deposit position with a short movement. When the lifting means is however dealing with the second stack, it is further removed from the reject  
30 deposit position. Although the lifting means, which is also termed a so-called feeder, could move the defective

sheet metal panels in this case to the reject deposit position, in accordance with an advantageous design of the invention is such that the lifting means deposits the defective panels and/or panel sets on the longitudinal conveying means, which is dealing with the second stack in the second longitudinal position, which then for its part feeds the defective sheet metal panels and/or the sets thereof to the deposit position. The lifting means does therefore not have to complete the full distance between the second tendering position and the reject deposit position.

[0011] It is an advantage for the longitudinal conveying means to bridge over the first tendering position in its second longitudinal position.

[0012] The longitudinal conveying means is for example a conveyor belt.

[0013] In the first and in the second longitudinal position the longitudinal conveying means preferably has opposite conveying direction, that is to say it conveys sheet metal panels toward the working site and in the second longitudinal direction in the first longitudinal position in the opposite direction to the reject deposit position.

[0014] Preferably there is a detection means to detect defective singling. In the case of defective singling more than one sheet metal panel is taken from the first or, respectively, second stack. For instance, the sheet metal panels stick together.

[0015] A preferred field of application of the singling device is for example sheet metal forming. The singling device advantageously constitutes a component of a sheet metal forming system.

[0016]For offering the first and, respectively, the second stack at the first and, respectively, second tendering position it is convenient to provide a first and/or second transverse conveying means. This means for example  
5 comprises a transport carriage. Furthermore a design with conveyor belts would be possible.

[0017]As already explained a second longitudinal conveying means may be provided between the working site unit two tendering positions for conveying the singled sheet metal  
10 panels to the working site. In the first longitudinal position of the first longitudinal conveying means, when handling the first sheet metal panel stack, the first longitudinal conveying means conveys the sheet metal panels to the second longitudinal conveying means. In the  
15 second longitudinal position of the first longitudinal conveying means, when handling the second sheet metal panel stack, the lifting means deposits the panels directly on the second longitudinal conveying means. The second longitudinal conveying means is preferably  
20 constituted by a conveyor belt.

[0018]Further advantageous developments and convenient forms of the invention will be understood from the following detailed descriptive disclosure of one embodiment thereof in conjunction with the accompanying  
25 drawings.

#### LIST OF THE SEVERAL VIEWS OF THE FIGURES.

[0019]Figure 1 shows a singling device in accordance with the invention, one longitudinal conveying means assuming a first longitudinal position.

30 [0020]Figure 2 shows the singling device in accordance with figure 1, the longitudinal conveying means being in a

second longitudinal position.

DETAILED ACCOUNT OF WORKING EMBODIMENT OF THE  
INVENTION.

[0021]A lifting means 9 of a singling device 10 is mounted  
5 on a guide means 11 for longitudinal movement thereon. It  
can be reciprocated between a first and a second tendering  
position 12 and 13 in the longitudinal direction 14.

Underneath it on the lifting means 9 there are suction  
means 15, with which the lifting means 9 can lift sheet  
10 metal panels 16 from the sheet metal panel stacks 17 and  
18 to the two tendering positions 12 and 13. The sheet  
metal panel stacks 17 and 18 are held on transport  
carriages 19 and 20, which may be moved into the singling  
device 10 in the transverse direction and constitute  
15 transverse conveying means.

[0022]When a sheet metal panel stack 17 or 18 has been  
dealt with so that one of the transport carriages 19 or 20  
is free, the respective transport carriage 19 or 20 is  
moved out of the singling device 10, reloaded with sheet  
20 metal panels 16 and returned to the respective tendering  
position 12 or 13. The lifting means 9 alternatively  
handles sheet metal panel stacks 17 and 18 held on the  
tendering positions 12 and 13. The sheet metal panels 16  
are conveyed by it in the longitudinal direction 14 to a  
25 working site 21, which may for example be washing unit or  
a sheet metal press for reshaping the sheet metal panels  
16.

[0023]During handling the sheet metal panel stack 17  
remote from the working site 21 on the first tendering  
30 position 12 the lifting means is then aided by a  
longitudinal conveying means 22, for example a conveyor

belt. The longitudinal conveying means 22 is in figure 1 located in a first longitudinal position 23 bridging over the second tendering position 13 facing the working site 21. It is able to be shifted on a carriage 24 or some  
5 other shifting means in the longitudinal direction 14.

[0024] Pull-apart means 25, for example in the form of pull-apart magnets arranged on either side of the tendering positions 12 and 13, aid singling of the respectively top sheet metal panels 16 from the stacks 17  
10 and 18.

[0025] After lifting a sheet metal panel 16 from the stack 17 at the first tendering position 12 the lifting means 9 moves in the longitudinal direction toward the working site 21. However, it does not complete the full distance  
15 to same, but deposits the sheet metal panel 16 on the longitudinal conveying means 22 at a deposit position 26.

The movement of the lifting means 9 from the lifting of the sheet metal panel 16 from the stack 17 until deposit of the sheet metal panel 16 at the deposit position 26 on  
20 the longitudinal conveying means 22 is indicated by an arrow 27. Then the longitudinal conveying means 22 conveys the sheet metal panel 16 to a second longitudinal conveying means 28, for example also in the form of a conveyor belt, which transports the sheet metal panel on  
25 further to the working site 21. In figure 1 a sheet metal panel 16 is illustrated on transfer between the longitudinal conveying means 22 and 28. At the working site the sheet metal panel 16 is for example washed, oiled and/or reshaped using a press. The panel, which may be of  
30 steel plate, is therefore converted into part of the bodywork of a motor vehicle for example.

[0026]The distance 36 traveled by the lifting means 9 between the stack 17 at the tendering position 12 and the deposit position 26 on the longitudinal conveying means 22 is substantially shorter than the overall distance between the tendering position 12 and the second longitudinal conveying means 28 or, respectively, the working site 21.

The saving in the distance traveled leads in this case to a double advantage, since the lifting means 9 only moves the short distance 26 for each singling operation twice.

[0027]At the working sites 12 and 13 there are detection means 29 for defects. One detection means 29 comprises for example weight sensors, an optical monitoring system or the like.

[0028]When the lifting means 9 for example lifts a defective sheet metal panel 16 or more than one sheet metal panel 16 from the stack 17, the detection means 29 will signalize such an error to the central control means 30 and monitors the functions of the singling means 10. The control means 30 is connected by a connection 37 with the lifting means 9 and connections (not illustrated) with the longitudinal conveying means 22 and 28. The lifting means 9 will move any defective sheet metal panel 16 or a set thereof with two or more unsingled sheet metal panels 16 of the stack 17 to a reject deposit position 31, which is arranged at the end of the singling device 10 opposite to the working site. The lifting means 9 is in this case reversed in direction and deposits the sheet metal panel or panels 16 on a roller conveyor 32 preceding the deposit position 31, on which conveyor the panel or panels 16 roll on to the deposit position 31.

[0029]In the situation depicted in figure 2 the carriage



19 is empty. The sheet metal panel stack 17 has been unloaded by the lifting means 9. The carriage 19 may now be moved on its wheels 30 in the transverse direction from the singling device 10 and reloaded with new sheet metal panels 16. Then it is moved back to the tendering position 12. In the meantime the carriage 20 is unloaded at the tendering position 13 by the lifting means.

[0030]Then the longitudinal conveying means 22 is in a second longitudinal position 33, in which it is displaced from the working site 21, to the left in the figure. In the longitudinal position 33 the longitudinal conveying means 22 bridges over the tendering position 12. The tendering position 13 is freely accessible for the lifting means 9. It lifts separate panel 16 from the carriage 20 and deposits same, after a movement in the longitudinal direction 14 along the guide means 11, on the second longitudinal conveying means 28. The full movement is indicated by an arrow 38. The second longitudinal conveying means 28 feeds the sheet metal panels to the working site 21.

[0031]If the lifting means 9 fails to function properly and lifts more than one sheet metal panel 16 from the stack 18, it does not have to return along the entire distance to the reject deposit position 31 for depositing the sheet metal panel stack after it direction of movement has been reversed, and instead deposits the defective panel 16 or, respectively, the sheet metal panel stack, on the first longitudinal conveying means 22. For this purpose it moves to the left in terms of the figure from the working site 21 toward the deposit position into a position 34, in which the lifting means 9 is indicated in

figure 2 in chained lines. The longitudinal displacement 35 between the tendering position 13 and the position 34 is in any case substantially shorter than the full displacement between the tendering position 13 and the deposit position 31. The conveying direction of the longitudinal conveying means 28 is, if a sheet metal panel stack is to be conveyed to the deposit position 31, opposite to the direction of conveying in the longitudinal position 23. The longitudinal conveying means 28 moves the defective panel 16 or, respectively, the sheet metal panel stack to the reject deposit position 31, that is to say in the working example to the roller conveyor 32.